Entomotaxonomia (2021) 43(1):–, DOI: 10.11680/entomotax.2021004, ISSN 2095–8609

Descriptions of two new species in the genus *Linoeucoila* Lin (Hymenoptera: Figitidae) from China

Ting QI[1], Zhiwei LIU[2, 3], Yaoqing LI[1], Yiping WANG[1]①

1. *College of Forestry and Biotechnology, Zhejiang Agricultural and Forestry University, Lin'an, Zhejiang 311300, China*

2. *Department of Biological Sciences, Eastern Illinois University, Charleston, Illinois 61920, USA*

3. *College of Life Sciences, Central South University of Forestry and Technology, Changsha, Hunan 410004, China*

Abstract: The genus *Linoeucoila* Lin is reported for the first time from mainland China, together with descriptions of two new species of the genus: *L. huayana* **sp. nov**. and *L. laotudingzila* **sp. nov.**

Key words: Cynipoidea; Eucoilince; taxonomy

中国林匙胸瘿蜂属二新种记述（膜翅目：环腹瘿蜂科）

齐婷[1]，刘志伟[2,3]，李耀清[1]，王义平[1]①

1. 浙江农林大学林业与生物技术学院，浙江 临安 311300；2. Department of Biological Sciences, Eastern Illinois University, Charleston, Illinois 61920, USA；3. 中南林业科技大学生命学院，湖南 长沙 410004

摘要：记述采自中国大陆的林匙胸瘿蜂属及其 2 新种：华燕林匙胸瘿蜂 *L. huayana* **sp. nov.** 和光林匙胸瘿蜂 *L. laotudingzila* **sp. nov.**。

关键词：瘿蜂总科；匙胸瘿蜂亚科；分类

Introduction

Members of the superfamily Cynipoidea of wasps (Hymenoptera: Cynipoidea) are well known as gall wasps because of one of its families, the Cynipidae, is comprised exclusively of species that are associated with plant galls, either inducing these galls or living as guests inside the galls (Ronquist *et al.* 2015). However, all other cynipoid families are koinobiont endoparasitoids of a broad range of insect hosts (Ronquist 1995, 1999). Among these parasitic families, the Figitidae contains the most species in superfamily Cynipioidae, consisting of more than 1400 known species in 132 genera (Buffington *et al.* 2006). Its members are parasitoids of various insect hosts in the orders Diptera, Homoptera, Hymenoptera, and Neuroptera (Ronquist 1999; Buffington *et al.* 2012). The phylogenetical studies on this family have elucidated the relationships and evolution of the family and formed the framework for the current classification of the family (Buffington *et al.* 2007, 2009, 2012). However, the Figitidae remains the most poorly known family of the Cynipoidea taxonomically (Ronquist

---

Accepted 20 August 2020. Published 25 March 2021. Published online 16 March 2021.

① Corresponding author, E-mail: wyp@zafu.edu.cn

1999) despite recent efforts to change this situation (Forshage & Nordlander 2008; Forshage *et al.* 2013).

Of the 12 subfamilies currently recognized in Figitidae, the subfamily Eucoilinae Tomson, 1862 is most spectacular for two reasons. It is the most species-rich subfamily of Figitidae, currently comprised of about 1000 species in 80 genera and making up more than 70% of the species diversity of the family (Ronquist 1995, 1999; Fontal-Cazalla *et al.* 2002; Buffington *et al.* 2007). And it is unequivocally recognizable by the presence of an elevated glandular plate, the so-called "disc"/"cup" on the mesoscutellum (Ronquist 1999; Forshage & Nordlander 2008). This subfamily is further divided into six tribes, including Diglyphosematini Belizin 1961, Zaueucoilini Buffington 2009, Kleidotomini Hellén 1960, Trichoplastini Kovalev 1989, Eucoilini Thomson 1862, and Ganaspini Belizin 1961 (Forshage & Nordlander 2008; Buffington 2009). In China, this group has remained virtually unknown, except for a few descriptive work in recent years (Lin 1987, 1988; Li *et al.* 2017).

The genus *Linoeucoila* Lin belongs to the tribe Eucoilini, and was first described by Lin (1988). So far, there are 12 species in the world, 11 species in Taiwan of China and *L. laterostriata* from South Africa (Buffington 2009; van Noort *et al.* 2015). In this paper, we describe two new species *L. huayana* **sp. nov** and *L. laotudingzila* **sp. nov.** from mainland China.

Material and methods

Morphological terminology follows Weld (1952), Quinland (1986, 1988), Lin (1988), Ronquist & Nordlander (1989), Ronquist (1995), and Fontal-Cazalla *et al* (2002). Abbreviations: LOL — the distance between lateral and frontal ocellus; POL — post-ocellardistance; OOL — ocellar-ocular distance.

The relative observations and measurements throughout the paper were taken by Phenom^{TM} Pro Desktop scanning electron microscopy and a Leica M 205C stereomicroscope (Wetzlar, Germany).

The specimens used in this study were obtained largely by sweeping net. All type specimens are deposited in the Hymenoptera Collection of Zhejiang Agricultural and Forestry University, Lin'an, China.

Taxonomy

Linoeucoila Lin, 1988

Type-species: *Linoeucoila* Lin, 1988: 10.

Diagnosis. Pronotal plate moderately large, with rather broad median bridge and a large and open cavity on each side. Sides of pronotum with obvious lateral ridge, anteriorly with a long band of vertical pubescence, sometimes also with scattered hairs behind it; anterior parallel line and parapsidal line present, but sometimes indistinct; notaulus absent; disc of scutellum rounded or subtruncate, dorsal surface foveate-rugose, with lateral ridge and scattered pubescence; scutellar cup protruded posteriorly, rounded or elliptical in dorsal view; surface concave, and with 2–3 lateral setae.

The genus *Linoeucoila* is a member of the tribe Eucoilini. Morphologically it resembles *Trybliographa* Forster, but it is distinctly different from the latter by its almost circular scutellar cup, well elevated scutellar disc, and usually smooth and polished body.

Distribution. China and South Africa.

1. ***Linoeucoila huayana*** **sp. nov.** (Figs 1, 2B–F)

Description. Female. Body length 1.50–1.70 mm, fore wing 2.30–2.40 mm.

Color. Head and thorax black. Metasoma and legs fulvous; antenna dark brown; wings hyaline, veins fulvous; hairs on body fulvous. Metasoma fulvous in female and chestnut in male.

Head (Figs 2B, 2C). Head distinctly narrower than thorax, about 0.56 times as long as wide in dorsal view, strongly convergent behind eyes; vertex and occiput reticulate; LOL: POL: OOL about 1.1 : 1.8 : 1.9; compound eye bare, and eyes height 1.6 times as long as width; malar suture absent. In frontal view, lower face coriaceous and indistinctly striate; gena coarsely coriaceous.

Antenna (Figs 1C, 1D). Antennae with 13 flagellomeres, 3.0 times as long as width of head in dorsal view, flagellomeres 3 and 4 subequal in length, 9-segmented club, with rhinaria and hairs.

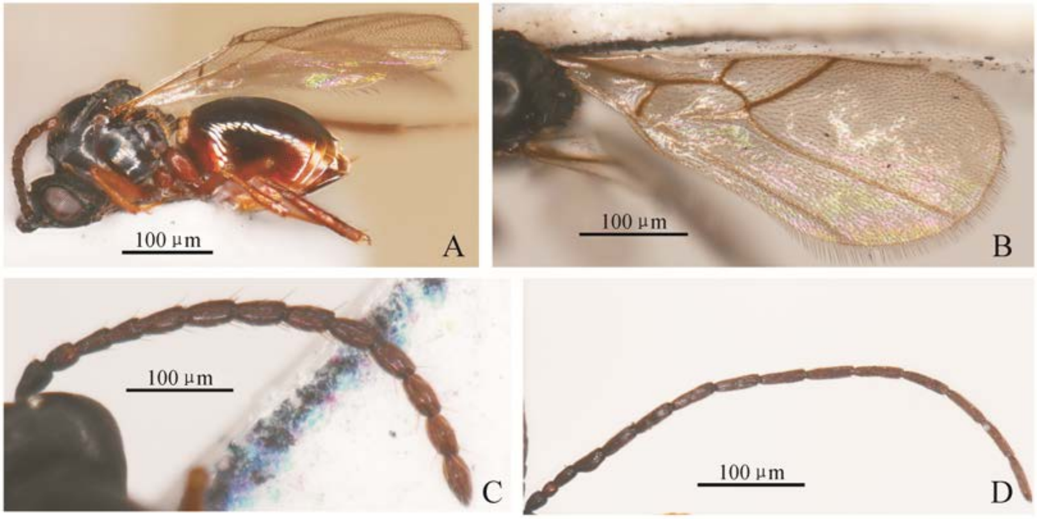

Figure 1. *L. huayana* **sp. nov.** A–C. ♀; D. ♂; A. Body, lateral view; B. Fore wing; C, D. Antenna.

Mesosoma (Figs 2C, 2D). In dorsal view, pronotum with large anterior lateral impressions open laterally, pronotal plate large, wider posteriorly than anterior part, glabrous anteriorly and striate posteriorly, with short ridges laterally; median pronotal bridge moderately broad; dorsal margin concave; lateral surface of pronotum finely sculptured anteriorly and on small areas posterolaterally. Mesoscutum shorter than wide, about 0.90 as long as wide and with short hairs; anterior parallel lines and parapsidal lines present, notauli absent. Mesopleuron smooth and convex; mesopleural sulcus present. Metanotum oblique; metapleuron bare, with multiple subparallel longitudinal carinae in lower half; anterior ventral fovea large, and posterior margin straight. Lateral bar striate. Anterior foveae of mesoscutellum large, deep, and shining smooth. Scutellum slightly shorter than wide, about 0.85 times as long as wide, areolate-rugose, and lateral ridge conspicuous. Scutellar plate ovate, about 1.50 times as long as wide, convex, with transverse striate, with thin rim; pit of scutellar plate circular and with 2 hairs. Propodeum short, lateral propodeal carinae parallel, slightly expanded posteriorly.

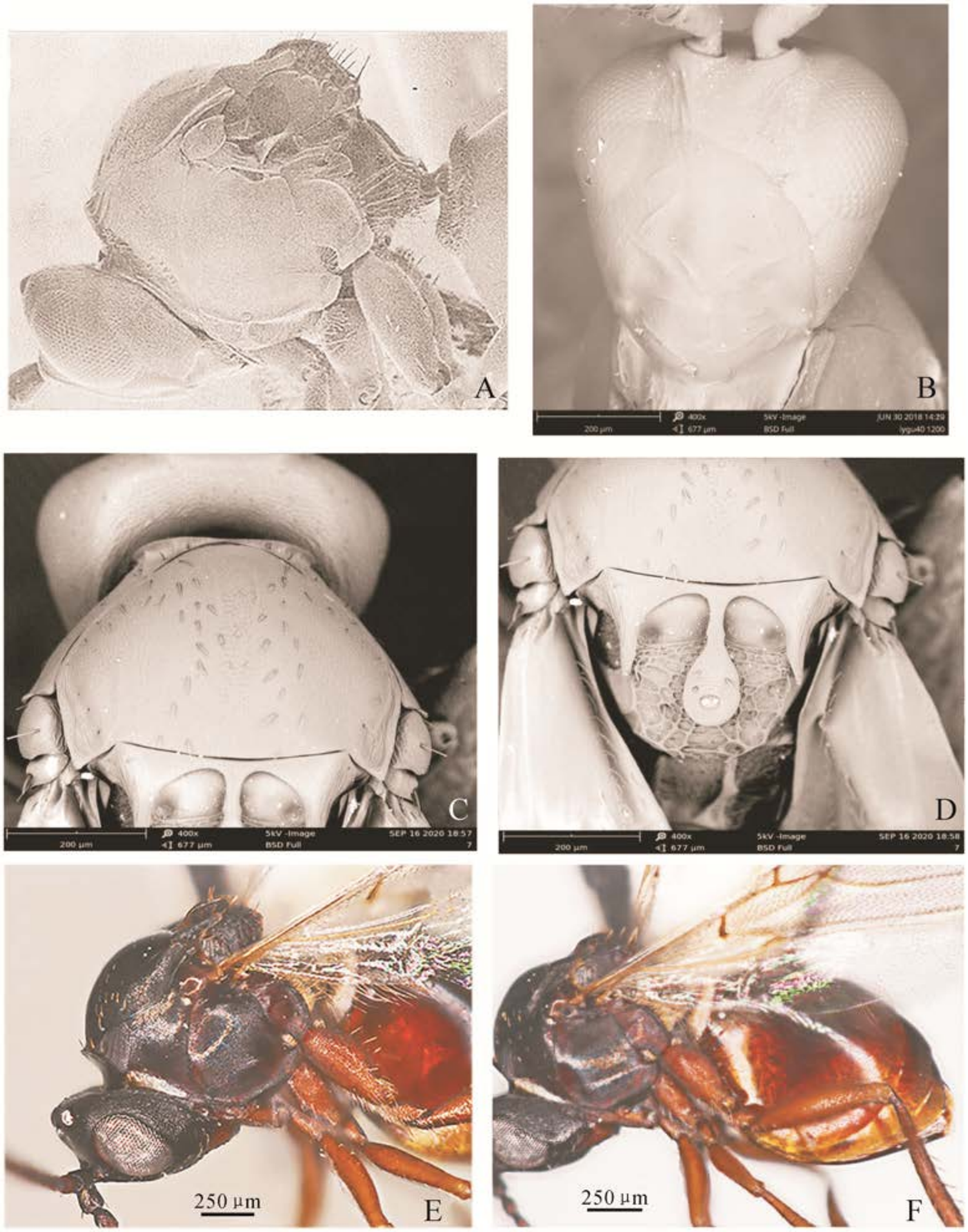

Figure 2. A. *L. caperata* Lin, 1988 (Imitation from Guirui Lin picture); B–F. *L. huayana* **sp. nov.**, ♀; A. Head, lateral view; B. Head, frontal view; C. Mesosoma, dorsal view; D. Scutellum, dorsal view; E, F. Body, lateral views.

Legs. Procoxae slightly smaller than either meso- or metacoxae; fore coxa and femora sparsely setose; mid and hind coxa with distinct anterior and posterior dorsoventral setal bands; remaining leg segments with sparse, evenly distributed setae, becoming slightly more dense and appressed on tarsomeres.

Fore wing (Fig. 1B). Hyaline, forewing about 2.7 times as long as wide, with moderately dense pubescence; radial cell opened anteriorly, about 2.20 times as long as wide.

Metasoma (Fig. 2F). Longer than thorax, ratio about 1.3 : 0.5 : 0.8. Base of largest tergite with a broad, complete ring of hairs and some scattered hairs posterior to the hairy ring; tergite 4–6 visible, finely punctuate.

Male (Fig. 1D). Body length 1.85 mm, fore wing 2.39 mm. Similar to the female, except as follows. Head in dorsal view narrower than thorax, about 0.6 width of thorax; LOL : POL : OOL about 1.0 : 1.7 : 1.8; malar suture absent; eye large, about 1.70 as high as wide. Antenna 15-segmented, filiform, about 5.60 times as long as wide, 3rd flagellomere shorter than 4th flagellomere, F4 distally swollen; all flagellomeres with rhinaria.

Holotype. ♀, **China**, Liaoning, Laotudingzi, 16-VII-2011, Huayan CHEN, sweep net. **Paratypes**. 1♀, **China**, Fujian, Wuyishan, 15-IX-1989, Jiashe WANG, sweep net; 1♀, **China**, Yunnan, Tengchong, Qushixiang, 19-VIII-2011, Huayan CHEN, sweep net; 1♀, **China**, Shanxi, Qinshui, 24–25-VII-2012, Huayan CHEN, sweep net; 1♂, **China**, Sichuan, Wolong, 20-VII-2006, Yiping WANG, sweep net; 2♂, **China**, Liaoning, Laotudingzi, 16–19-VII-2011, Huayan CHEN, sweep net; 1♂, **China**, Zhejiang, Qianqingtang, 2012-X, Malaise trap.

Diagnosis. This new species is similar to *L. caperata* Lin, 1988, but can be distinguished from the latter by the lack of the malar suture (Fig. 2B) present in *L. caperata* (Fig. 2A).

Etymology. The specific epithet is derived from Latin "*huayana*", refering to the first name of the holotype collecter.

2. ***Linoeucoila laotudingzila* sp. nov.** (Figs 3, 4B–F)

Description. Female. Body length 3.25 mm, fore wing 3.21 mm.

Color. Head black; thorax maroon; metasoma black and brown; antenna fuscous, 10–13 segmented black; legs, veins and hairs on body fulvous; wings hyaline.

Head (Fig. 4B). In dorsal view, distinctly narrower than thorax, about 0.60 as long as wide, strongly convergent behind eyes; vertex and occiput reticulate; LOL: POL: OOL about 1.2: 2.0: 2.8; compound eye glabrous, about 1.50 as high as wide; malar space about 0.70 times as high as eyes. In front view, low face indistinctly striate and pubescent; gena coarsely coriaceous.

Antenna (Figs 3C, 3D). In dorsal view antennae 13-segmented, about 3.50 times as long as width of head, F3 shorter than F4, 8-segmented clavate, with rhinaria and hairs.

Mesosoma (Figs 4C–E). Ratio of dimensions of thorax as 9.4 : 7.9 : 9.3. In frontal view pronotum with large anterior lateral impressions open laterally, pronotal plate large, anterior part of pronotal plate as wide as posterior part, with short ridges laterally, dorsal margin rounded; side of pronotum finely sculptured, anterior and posterolateral small areas of markedly dense pubescences. Mesoscutum short, about 0.9 times as long as wide and with short hairs; anterior parallel lines and parapsidal lines present, notauli absent. Mesopleuron smooth and convex; mesopleural carina present. Metanotum not concealed under scutellum. Metapleuron bare, anteroventral cavity large, and posterior margin straight. Lateral bar striate.

Scutellar foveae large, deep, and shining smooth. Disc of scutellum about 0.86 times as long as wide, areolate-rugose, hairs, rounded posterior, lateral ridge distinct. Scutellar plate ovate, about 1.30 times as long as wide, convex, smooth, with thin rim, pit of scutellar plate circular. Propodeum short, lateral propodeal carinae curve, slightly expanded posteriorly, and densely pubescent.

Legs. Procoxae slightly smaller than either meso- or metacoxae; all coxae sparsely setose with no apparent banding or patches of setae. Femora sparsely setose, with increased density of appressed setae on tibiae and tarsomeres.

Fore wing (Fig. 3B). Wings of normal shape, hyaline, surface moderately pubescent and ciliate along margin; radial cell of fore wing relatively long, about 1.98 times as long as wide, completely opened anterior margin; cubitus indicated by trace of pigmentation.

Metasoma (Fig. 4F). Longer than thorax, ratio of dimensions about 1.6 : 0.7 : 1.0. Metasoma petiole abruptly widened posteriorly; base of largest tergite with dense, complete ring of hairs; tergite 2–5 visible, tergite 4, 5 without punctuate in lateral view.

Male (Fig. 3D). Body length 2.28 mm, fore wing 2.50 mm. Similar to ♀ except as follows: head in dorsal view narrower than thorax, about 0.6 as long as wide; LOL : POL : OOL about 1.2 : 1.9 : 2.2; malar space about 0.5 times as high as eye; eye large, about 1.50 times as high as wide. Antenna long, about 6.00 times as width of head, 15-segmented, filiform, F3 slightly shorter than F4, F4 inflated, with rhinaria, each segment appressed.

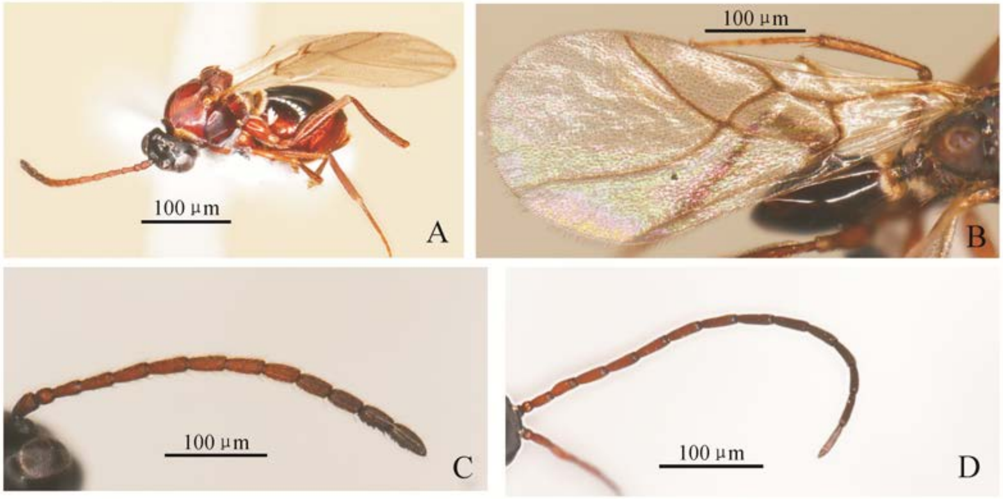

Figure 3. *L. laotudingzila* **sp. nov.** A–C. ♀; D. ♂. A. Body, lateral view; B. Fore wing; C, D. Antenna.

Holotype. ♀, **China**, Liaoning, Laotudingzi, 17-VII-2011, Huayan CHEN, sweep net. **Paratypes**. 1♂2♂, **China**, Liaoning, Laotudingzi, 16–19-VII-2011, Huayan CHEN, sweep net.

Etymology. The specific epithet is derived from the Latin “*laotudingzila*”, refering to the location of type specimens.

Diagnosis. This new species is similar to *L. armata* Lin, 1988, but it can be distinguished by the scutellar plate smooth, posterior fovea without hairs; scutellar plate is striate, posterior fovea with 2–3 hairs in *L. armata* (Fig. 4A).

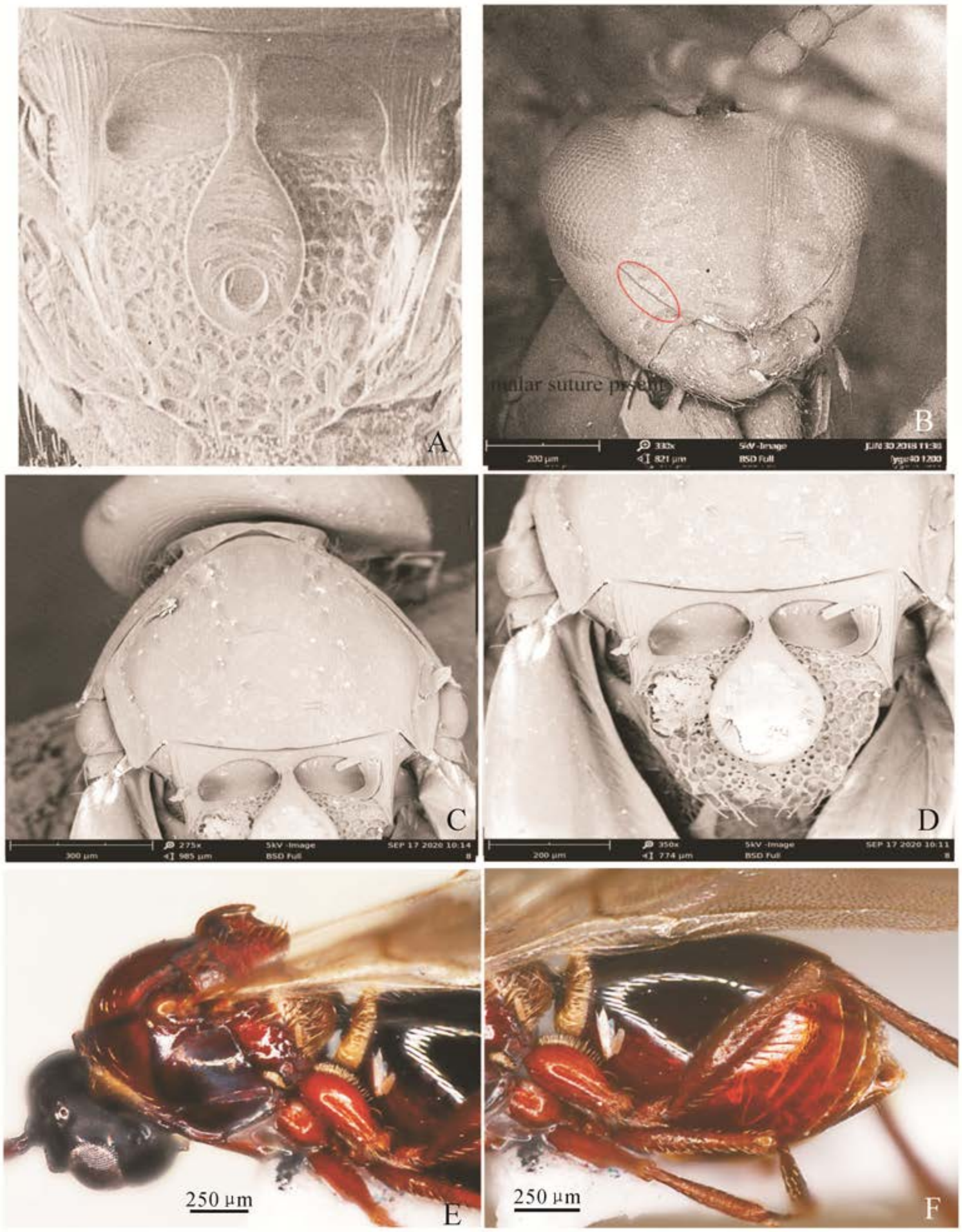

Figure 4. A. *L. armata* Lin, 1988 (Imitation from Guirui Lin picture); B–F. *L. laotudingzila* **sp. nov.**, ♀. A, D. Scutellum, dorsal views; B. Head, frontal view; C. Mesosoma, dorsal view; E. Mesosoma, lateral view; F. Metasoma, lateral view.

Acknowledgements

The project was supported by two research grants from the National Natural Science

Foundation of China (31472032), the Zhejiang Provincial Natural Science Foundation for Distinguished Young Scholars (LR14C040002), a scholarship from the China Scholarship Council, and a visiting researcher scholarship from Eastern Illinois University. ZL's participation in this study was partly supported by a visiting professorship from the Central South University of Forestry and Technology.

References

Buffington ML. 2009. Description, circumscription and phylogenetics of the new tribe Zaeucoilini (Hymenoptera: Figitidae: Eucoilini), including a description of a new genus. *Systematic Entomology*, 34: 162–187.

Buffington ML, Brady SG, Morita SI & Van Noort SV. 2012. Divergence estimates and early evolutionary history of Figitidae (Hymenoptera: Cynipoidea). *Systematic Entomology,* 37: 287–304.

Buffington ML, Liu Z & Ronquist F. 2006. Cynipoidea. *Memoirs of the American Entomological Institute*, 77: 811–824.

Buffington ML, Nylander JAA & Heraty JM. 2007. The phylogeny and evolution of Figitidae (Hymenoptera: Cynipoidea). *Cladistics*, 23: 1–29.

Fontal-Cazalla FM, Buffington ML, Nordlander G, Liljeblad J, Ros-Farré P, Nieves-Aldrey JL, Pujade-Villar J & Ronquist F. 2002. Phylogeny of the Eucoilinae (Hymenoptera: Cynipoidea: Figitidae). *Cladistics*, 18: 154–199.

Forshage M, Buffington ML & Nordlander G. 2013. Eucoilinae of North America: A revised catalog of genera and described species. *Proxeedings of the Entomological Society of Washington*, 115(3): 225–255.

Forshage M & Nordlander G. 2008. Identification key to European genera of Eucoilinae (Hymenoptera: Cynipoidea: Figitidae). *Insect Systematics & Evolution*, 39: 341–359.

Li YQ, Wang YP & Chen XX. 2017. Description of a new species of *Disorygma* Förster (Hymenoptera: Figitidae: Eucoilinae) from China. *Entomotaxonomia*, 39(4): 288–293.

Lin KS. 1987. *Aganaspis*, a new genus of Eucoilidae (Hymenoptera: Cynipoidea). *Taiwan Agricultural Research Institution Specicial Publication*, 22: 67–79.

Lin KS. 1988. The Eucoilidae from Taiwan, I. (Hymenoptera: Cynipoidea). *Journal of the Taiwan Museum*, 41(2): 1–66.

Quinland J. 1986. A key to the Afrotropical genera of Eucoilidae (Hymenoptera), with a revision of certain genera. *Bulletin of the British Museum* (*Natural History*) *Entomology Series*, 52: 243–366.

Quinland J. 1988. A revision of some Afrotropical genera of Eucoilidae (Hymenoptera). *Bulletin of the British Museum* (*Natural History*) *Entomology Series*, 56: 171–229.

Ronquist F. 1995. Phylogeny and early evolution of Cynipoidea (Hymenoptera). *Systematic Entomology*, 20: 309–335.

Ronquist F. 1999. Phylogeny, classification and evolution of the Cynipoidea. *Zoologica Scripta*, 28: 139–164.

Ronquist F, Nievesaldrely J, Buffington ML & Liljeblab J. 2015. Overview of the taxonomy, diversity and biology of Cynipoidea. *PLoS ONE*, 10(5): e0123301. doi:10.1371/journal.pone.0123301.

Ronquist F & Nordlander G. 1989. Skeletal morphology of an archaic cynipoid, Ibalia rufipes (Hymenoptera, Ibaliidae). *Entomologica Scandinavica* (supplement), 33: 1–60.

van Noort SV, Buffington ML & Forshage M. 2015. Afrotropical Cynipoidea (Hymenoptera). *ZooKeys*, 493: 1–176.

Weld LH. 1952. *Cynipoidea* (*Hymenoptera*), 1905–1950. Privately Published, Michigan, 351 pp.